DOCUMENT RESUME

ED 456 498 EA 031 159

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TITLE	The Relationship between Resources and Academic Achievement.
PUB DATE	2000-00-00
NOTE	22p.
PUB TYPE	Numerical/Quantitative Data (110) -- Reports - Evaluative (142)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Academic Achievement; Educational Change; Elementary Secondary Education; *Expenditures; Public Schools; *Resource Allocation; Statistical Data; *Student Improvement; *Teacher Education; Teacher Effectiveness; *Teacher Improvement; Teacher Student Ratio

ABSTRACT

This paper evaluates whether or not there is a direct academic-achievement benefit from additional expenditures on education in the United States. Numerous critics have said that education is already overfunded and that it can never be funded enough to make any appreciable difference. Berliner's study of 900 school districts in Texas in the 1993 "Kappan" reported that "academically more proficient teachers, who are more experienced, who are better educated, and who work with smaller classes, are associated with students who demonstrate significantly higher achievement." Variables that are associated with higher student achievement are all those that require money. Rankings of the states on achievement using ACT and SAT scores and expenditures for public education show that there is a relationship between expenditures per pupil and achievement. Arkansas is used as a case study on the influences of the correlation between resources and student achievement. Arkansas school records indicate that higher achievement is associated with smaller class size. However, findings indicate that in plotting expenditures against ACT scores for the districts that expend less than $3,500 per pupil, there does not appear to be much cost-benefit relationship. Their expenditures are not predictive of more achievement because the money is not going into instruction, but into survival categories such as heating, electricity, buses, and bare-minimum salaries to hire teachers who are essentially "warm bodies." (Contains 20 references.) (DFR)

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The Relationship between Resources and Academic Achievement

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The Relationship Between Resources and Academic Achievement

Is there a direct academic achievement benefit for additional expenditures in education in the United States? This is a critical question and one that is frequently asked, one with major policy implications. Numerous critics have said that education is already over-funded and that it can never be funded enough to make any appreciable difference.

Related Literature

This writing is not the first to show a relationship between costs per student and student achievement. Berliner (1993) reported that "academically more proficient teachers, who are more experienced, who are better educated, and who work with smaller classes, are associated with students who demonstrate significantly higher achievement" (pp. 636-637).

Berliner further found (1993) that

> "An unusual set of data from Texas looks at the effects of teacher ability, teacher experience, class size, and professional certification on student performance in reading and mathematics. Data on millions of students in 900 districts were examined longitudinally from 1986 to 1990. Two rather simple findings emerged. First, teachers' academic proficiency explains 20% to 25% of the variation across districts in students' average scores on academic achievement tests. The smarter the teachers, the smarter their pupils appeared to be, as demonstrated by results on standardized achievement tests administered to both groups. Second, teachers with more years of experience have students with higher test scores, lower

EA 031159

> dropout rates, and higher rates of taking the SAT. Experience counts for about 10% of the variation in student test scores across districts. The effects are such that an increase of 10% in the number of teachers within a district who have nine or more years experience is predicated to reduce dropout rates by about 4% and to increase the percentage of students taking the SAT by 3%. Dollars appear to be more likely to purchase bright and experienced professionals, who, in turn, are more likely to provide us with higher-achieving and better-motivated students. (Berliner, 1993, p. 638)

Several observations could be made about Berliner's study. First of all, the variables that are associated with higher student achievement in the Texas study are all variables that require resources–money, to say it more exactly. Secondly, master's-degreed teachers cost more than the average teacher. Thirdly, teachers with more than five years of experience are more expensive. Teachers with the doggedness and determination to face today's challenges, including the incessant negative media portrayals, cost more.

Berliner continues with

> "The Texas data also show that, in grades 1 through 7, once class size exceeds 18 students, each student over that number is associated with a drop in district academic achievement, This drop is estimated to be very large–perhaps 35 percentile ranks on standardized tests–between a class size of, say, 25 and a class size of 18. Furthermore, the

> percentage of teachers with master's degrees accounted for 5% of the variation in student scores across districts in grades 1 through 7. So we learn from the Texas study and other data that support its conclusions that academically more proficient teachers, who are more experienced, who are better educated, and who work with smaller classes, are associated with students who demonstrate significantly higher achievement . . . "For those who point out that education costs have been rising faster than inflation, it is important to note that special education populations have been rising as well. It costs 2.3 times as much money to educate a child in special education as it does to educate a child in the regular education program. Most of the real increases in educational expenditures over the last 20 years have been the result of increased costs for transportation, health care, and special education. They have not been connected with regular instruction or teachers' salaries" (Berliner, p. 636-637).

The Berliner article of the 1993 *Kappan* should be required reading for all who assert that today's schools are not as cost effective or efficacious as the schools of a generation ago.

The Correlation Issue

The ranks of the states on their primary college entrance examinations (ACT and SAT) were utilized for correlation along with the NEA's ranks (1998, *Ranking of the States*

1997) for per-pupil expenditures. These data are shown in Table 1:

Table 1

Rankings of the states on achievement Using ACT scores and expenditures for public education

State	ACT Rank	ACT average	Avg. Exp. /pupil	Rank, Expenditure
Alabama	22	20.1	$5478	36
Arizona	15	21.2	4387	50
Arkansas	20	20.2	4498	48
Colorado	5	21.4	5550	34
Idaho	11	21.3	4794	46
Illinois	15	21.2	6048	27
Iowa	3	21.9	6424	20
Kansas	11	21.3	6132	24
Kentucky	22	20.1	5959	31
Louisiana	26	19.4	4876	44
Michigan	18	21.1	7318	11
Minnesota	1	22.1	6529	17
Mississippi	27	18.8	4547	47
Missouri	5	21.4	5370	39

Montana	4	21.7	5973	30
Nebraska	5	21.4	5613	33
New Mexico	20	20.2	5474	37
North Dakota	11	21.3	4844	45
Ohio	11	21.3	5909	32
Oklahoma	19	20.5	4486	49
South Dakota	5	21.4	4990	43
Tennessee	25	19.9	5286	42
Utah	5	21.4	4088	50
West Virginia	24	20.0	6902	14
Wisconsin	1	22.1	6999	13
Wyoming	5	21.4	6499	19

The correlation was .33105, $p < .0230$, $F=5.52$, and with the ranks of expenditures accounting for 11 percent of the variation in the ranks of student achievement. Thus, while the correlation between expenditures per student and achievement is not a perfectly linear one, it would not be fair to say that there is *no* relationship.

The SAT data were more persuasive than the ACT data; when the data from the 23 SAT states were ranked and correlated, the relationship between the ranked achievement scores and the ranked expenditures per-pupil was 0.44, significant at .0376, accounting for

19 percent of the variance. The ACT data had many tied ranks, making relationships more difficult to observe by calculation, and probably due to a numbering scale with fewer possibilities (range from 1 to 40 rather than 400 to 1600). By comparison, the SAT data had few tied ranks (see Table 2):

Table 2

Rankings of the states on achievement Using ACT scores and expenditures for public education

State	SAT Ranking	SAT average score	Per-pupil exp.	Exp. Rank
Alaska	3	1034	10393	1
California	8	1006	5327	41
Connecticut	5	1011	8855	4
Delaware	10	1033	7760	7
Florida	17	994	6030	26
Georgia	22	961	6030	29
Hawaii	15	995	6211	23
Indiana	20	988	6424	20
Maine	13	1002	6523	18
Maryland	5	1011	7052	12
Massachusetts	5	1011	7628	8

New Hampshire	3	1034	6557	16
New Jersey	10	1003	10133	2
New York	14	996	9628	3
North Carolina	21	976	5381	38
Oregon	1	1044	6602	15
Pennsylvania	19	990	7581	9
Rhode Island	18	992	8392	5
South Carolina	23	954	5357	40
Texas	15	995	6041	28
Vermont	8	1006	7581	10
Virginia	10	1003	6370	21
Washington	2	1038	6223	22

Other correlational findings on the national scale. The per-pupil expenditures of the top-5 achieving states (NEA, 1998) was compared to the per-pupil expenditures of the bottom-5 achieving states, and their expenditures were compared. There was a $1,955.60 per-pupil expenditure difference in favor of the top-5 achieving states as shown in Table 1 below:

Table 3

Comparison of Per-Pupil Expenditures Among the Top-5 Ranked Achievement States and Bottom-5 Achieving States

Top-five ranked achieving states	ACT/SAT score	Per-pupil expenditure
Wisconsin	22.1	$6999
Oregon	1044	6602
Minnesota	22.1	6529
Washington	1038	6223
Alaska	1034	10393

Mean per-pupil expenditure for top-five ranked achievement states: $7,349.20

Bottom-5 ranked achieving states	ACT/SAT score	Per-pupil expenditure
South Carolina	954	5357
West Virginia	20.0	6902
Tennessee	19.9	5286
Louisiana	19.4	4876
Mississippi	18.8	4547

Mean per-pupil expenditure for bottom-five ranked achievement states: $5,393.60

Standard deviation for PPE among bottom-five ranked achievement states: $904.55

Statewide Data

Arkansas could be used as a case study in the influences of the correlation between resources and student achievement. For the present, let us look at fiscal practices of *winners*, districts in Arkansas who did better than average (scored at or above the fiftieth percentile on the ACT). Because the ACT test has been used often for such comparisons, ACT scores will be used primarily here.

The data used were from the *1995-96 Arkansas Department of Education Annual School District Report Card*. Similar data from 1996-97 existed but did not make a satisfactory comparison since there had been a change in accounting system between the two years.

School districts in Arkansas were reviewed according to ACT score characteristics. Comparisons were made of 20-average-ACT or above districts, 20.5-and-above districts, 21-and-above districts, 21.5 ACT average-and-above districts, 22-and-above districts, 22.5 ACT-and-above districts, and 23-and-above districts. Basically what was done was a study of winners. Not a lot of effort was spent studying the districts whose senior classes averaged less than 20 on the ACT (20 marked the fiftieth percentile when these other data were current) since what is being studied in this instance is the characteristics of "winners," districts who scored at or above the 50th percentile of the ACT test at the time it was normed in 1990.

ACT 20 and Above School Districts. Out of Arkansas's 311 school districts, 143

posted average ACTs of 20 or above. Only three of the 20-and-above districts spent any less than $2900 per student in 1996-95, and only nine others spent any less than $3,000. Their average expenditure per child, to reach this level of being average according to the 1990 norms, was $3,397.45.

ACT 20.5 and Above School Districts. Going above the average by half an ACT point reduced the field to 103 districts. Only eleven spent under $3,000 per student in 1995-96, and an additional 18 were between $3,000 and $3,100. The average expenditure per student was $3,386.35. This funding level is still too low for minor differences to make any major changes in ACT level.

ACT 21 and Above School Districts. Setting the criteria for an average ACT of 21 for the graduating class of 1996 narrowed the analysis to 73 districts rather abruptly. There were only five districts with per-pupil costs under $3,000. The average per-pupil cost for the 21-ACT and above crowd was $3,416.50.

ACT 21.5 and Above School Districts. The crowd thinned to 47 school districts at this level of average ACT scores. The average per-pupil cost dipped slightly from the 21.0 level to $3,406.26 because of the exit of two notable very-high-cost, moderate-achievement school districts upon ascension to this ACT level. Only twelve of the districts spent less than $3,100 per student, and only four were under $3,000. No Arkansas school district was able to have a 21.5 ACT average senior class while spending less than $2,900 per student. It should be remembered that these were per-pupil

expenditures before the practice began of reporting the cost of the employee-benefit package was included in the cost of educating each child.

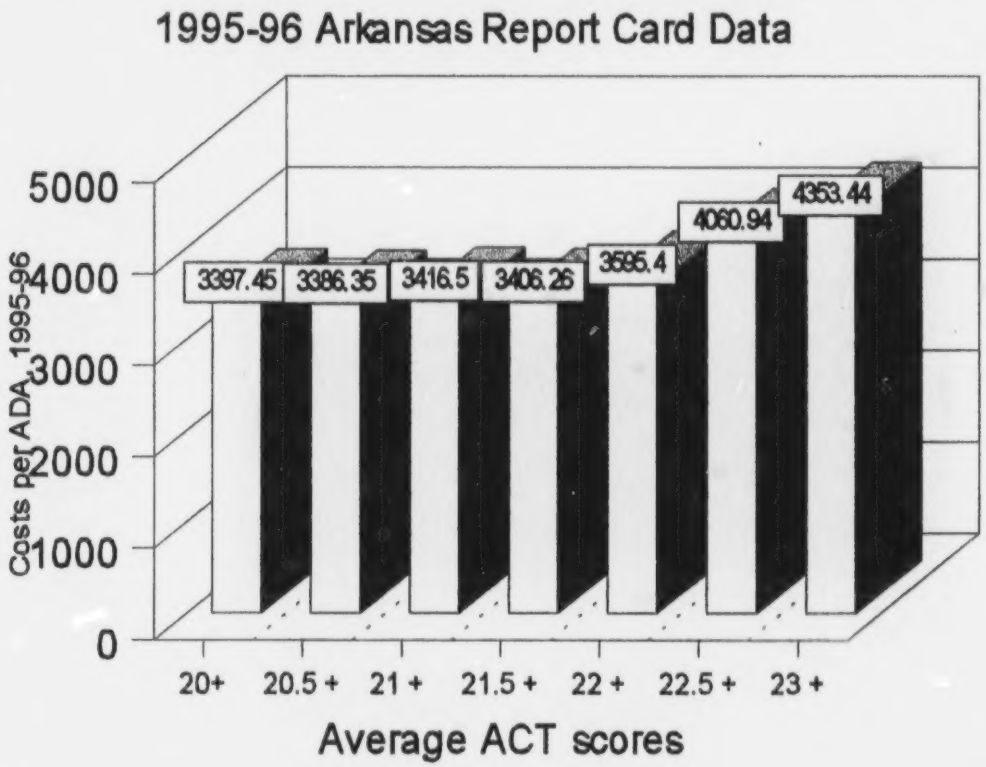
ACT 22 and Above School Districts. As a point of reference, an ACT of 22 places a senior at the 66th percentile. Twenty-five school districts had average ACTs of 22 or more. Only one had a per-pupil expenditure under $3,000 ($2,997) and only four others had expenditures under $3,100. The average expenditure was $3,595.40. Interestingly, twelve of these districts had Average Daily Memberships under 500, showing that an adequate education can occur in small Arkansas schools. This also points out the effectiveness of small class sizes and small school districts.

ACT 22.5 and Above School Districts. There were eight school districts among Arkansas' 311 that were able to sustain competition in a ACT 22.5-and-above environment. Only two spent less than $3,400 per student in 1995-96. The per-pupil cost for this strata averaged $4,060.94. Most were small, remote schools, typically with small class sizes, a direct contradiction to the consolidation drift of the Murphy Commission report.

ACT 23 and Above School Districts. There were four school districts in Arkansas with above-23 ACT averages in 1995-96, and all were under 500 ADM. Their average per-pupil expenditure was $4353.44. This average graduating-senior average ACT score placed them at the 73rd percentile

If all of these data are plotted, they make a initially flat, then upwardly linear-looking graph (see Cost-Benefit Comparison graph).

Cost-Benefit Comparison



Plotting expenditures against ACT scores, for the five strata of districts that expended less than about $3,500 per student, there does not appear to be much cost-benefit relationship. These represent districts with too few meager dollars per child for a few more or few less to

make much difference in outcomes. Their expenditures are NOT predictive of more achievement because that money is not going into instruction (*i. e.*, curriculum): it's going into survival categories like heating, electricity, buses, and bare-minimum salaries to hire "warm bodies" instead of the most qualified teachers that could be hired. Since it is likely that the money is being spent on survival issues, less of it is being spent on instruction, which is the visible output of the school. Towards the middle of the plot is the phenomenon that is being discussed: A fairly linear correlation (0.8693, both statistically and educationally significant), starting from $3,500 per student and going through $4,400. We as a state should be pushing for the $5,000 mark in 1995-96 purchasing power to see how much achievement can be boosted. Were we to do so, we would still be below the 1997-98 national average of $6,335 (NEA, 1998).

Table 4

Correlation Between ACT Scores and Expenditure Per ADA

ACT Level	Number of districts remaining at ACT level	Average Expenditure per ADA at ACT level
20.0 and above	143 of 311	$3397.45
20.5 and above	103	3386.35
21.0 and above	73	3416.50
21.5 and above	47	3406.26
22.0 and above	25	3595.40
22.5 and above	8	4060.94
23.0 and above	4	4353.44

Correlation between first and third columns=0.8693, $p < 0.0115$

Even including the "flat zone" data between 20. 0 and 21.5 in the data analysis, there was a 0.86 correlation between achievement as measured by the ACT and the average expenditure per student in average daily attendance. An additional correlative finding was the relationship of the average per-pupil expenditure for 1995-96, $3,457.56, to ACT scores. The ACT scores did not rise much above average for those districts who did not *spend* much above average.

Correlates with Achievement, Statewide

All data in Table 3 below are from the *1995-96 Arkansas Report Card.* There was a significant and negative correlation between ACT scores (ascending) and teacher-pupil ratio, -.88, indicating that higher achievement is associated with smaller class sizes. There was a positive relationship between ACT scores and millages with the highest-achieving graduating classes in the state coming from districts that taxed themselves at an average of 34.17 mills.

Table 5

Correlates with student achievement as measured by the ACT

ACT strata	Pupil-teacher ratio	Millage (Effort)	College remed. rate	Completion rate
20.0	14.16	31.42	44.24%	86%
20.5	14.17	31.34	44.14	86
21.0	14.08	31.49	43.32	86
21.5	14.17	32.12	39.37	85
22.0	13.40	32.45	40.64	85
22.5	12.03	32.95	58.19	87
23.0	11.93	34.17	58.68	88

The completion rate remained mostly constant across all levels of the ACT spectrum, indicating that students might complete a high school course of study while realizing varying amounts of scholarship.

The average expenditure of Arkansas districts of $3,457.56 puts barely 50 percent of them within the area of the plot where the excellence begins. It is as if half of the districts–and arguably half the children–of Arkansas barely had a chance, given the resources available to them, to have a graduating class with an ACT average of 21.5 or above. The resources weren't there for them when they needed them. The last thing policymakers should be thinking of is taking some away or dissipating what little is had.

Admittedly, there were districts in Arkansas who spent above-average money and did not realize above-average results with their graduating seniors on the ACT exam. This finding, on the state-wide scale, though, is little different than the experiences of many parents upon sending their children to college. It is possible to spend the money on college and not have the learning and ultimately the graduation to occur. But if the money was not spent on the opportunity to learn and to graduate, it is a 100 percent certainty that learning and graduation will *not* occur. To ask our teachers to wring more achievement out of our young people, while funding their efforts at the level of some third-world countries, is to ask our teachers to do what did not happen in the last year, the year before, the year before that, the year before it, and probably has never happened.

The same analysis that was depicted above was done for the two years before it

with the same results, only slightly different numbers. The fact that Arkansas teachers and administrators have been able to do this well with this little is a heroic testimony to the efficiency and determination of those remarkable individuals.

The Best Course of Action.

It is as John Sikula (1998) stated in the *Handbook of Research on Teacher Education*: "We have the expertise to do the job; we have the will to do the job of teaching our young; the question remains as to whether we will have the resources to do what is right."

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Date Filmed
February 14, 2002